~~Description~~

METHOD AND COMMUNICATIONS ~~ARRANGEMENT~~ SYSTEM FOR CONTROLLING INSTANCES OF ACCESS TO TRANSMISSION RESOURCES OF A COMMUNICATIONS NETWORK

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/03274 which was filed in the German language on September 20, 2000.

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a method and communications system for controlling instances of access to transmission resources of a communications network.

BACKGROUND OF THE INVENTION

Current telecommunications networks are formed from communications devices, switching devices and wire-bound or conducted and wireless connections connecting these devices, the communications devices - for example telephone terminals or personal computers - respectively assigned to individual subscribers being connected to the switching devices - also denoted as network nodes. Connections can be switched directly via the common used network nodes for the purpose of information transfer between communications devices connected to a common network node. In order to permit an information transfer between communications devices or subscribers connected to different network nodes, it is necessary to network the individual network nodes. The networking can be configured in such a way that the telecommunications network is split up into hierarchical levels in a multistage fashion.

In the case of a connection setup instituted, for example, by a calling subscriber, after the reception and evaluation of dialing and/or destination

information items by the network nodes connected to the calling subscriber, a path must be determined through the telecommunications network to the dialed destination~~, that is to say to~~. **That is,** the corresponding network node of the destination subscriber or called subscriber connected thereto. The aim of this pathfinding is to determine as short as possible a path inside the telecommunications network, in which case as few network nodes as possible are to be traversed in the course of the connection to the dialed ~~destination. The~~ **destination. The** optimum utilization of the trunks of the telecommunications network constitutes a further aim of the pathfinding. The method for optimum pathfinding by means of a telecommunications network is also denoted as alternate routing.

The connection of ~~in each case~~ two network nodes arranged in the telecommunications network is implemented via a limited number of mutually equivalent, wire-bound or wireless links or transmission channels. A plurality of equivalent links or transmission channels directed to the same destination are also denoted as a "group" or "trunk group". In current telecommunications networks based on digital transmission technologies, the trunk groups are formed by a specific number of time-division-multiplex-oriented transmission channels - also denoted as PCM highways.

Digital switching devices arranged in current telecommunications networks - for example a digital "EWSD" switching system from Siemens AG - are based on a digital switching network and a coordinated controller that is supported by peripheral processors. The switching system is of modular design~~, that~~**. That** is ~~to say~~ the line trunk groups for the external links - such as subscriber lines and trunks - are connected depending on request around a central core composed of coordination processor, coupling unit and clock

generator. All useful connections are switched via the switching network, the pathfinding through the switching network being performed by the coordination processor. The line trunk group forms the interface for the connection to the external lines. Line trunk groups of different configuration are present for connecting the various types of external lines such as subscriber lines and trunks - for example to further switching devices or communication networks. The line trunk groups respectively comprise a plurality of terminals - also denoted below as subscriber line units - for the purpose of matching the external lines, including the PCM coding, to a system-inherent interface.

The subscriber line unit assigned to a line trunk group concentrates the subscriber traffic of analog and digital subscriber lines connected thereto and of connected connecting cables for private branch exchanges. Subscriber line units can be arranged as a component of the network node locally in a switching device or detached therefrom in the vicinity of user groups. Detached subscriber line units are also denoted as front-end devices. An economic configuration of the subscriber access network with optimum transmission quality is achieved by means of the short subscriber lines achieved with the aid of front-end devices, and by means of the concentration of the subscriber traffic in the direction of the network node on digital and optical transmission links.

In current telecommunications networks, for example, those configured as a telephone network, a plurality of destinations configured as emergency call centers are set up, inter alia - for example police or firefighting units - which can be reached from every subscriber located in the telephone network by transferring destination or dialing information items or call numbers that are generally standard across the country. Current telephone networks are configured in such a way that a requested emergency call connection is passed on

or routed to the respective emergency call center assigned to the subscriber, for example the emergency call center situated most closely locally to the calling subscriber. Since - disregarding misuse or error - emergency call connections always arise from an acute emergency situation of a subscriber or a plurality of subscribers, such emergency call connections are to be switched inside the telephone networks with highest priority to the appropriate emergency call center. This requirement holds for normally utilized telephone networks, ~~but it~~ **and** also ~~holds, in particular,~~ when the telephone network is fully utilized by normal telephone traffic because of specific events and/or dead lines. A typical event of this type is, for example, the turn of the year, when a full utilization of the transmission resources provided by the telephone network is reached owing to the transfer of a large number of "congratulatory telephone calls", but at the same time there is an increased demand for high-priority emergency call connections that are to be switched - for example reporting personal injury and material damage caused by fireworks.

In current telephone networks ~~it is known for the purpose of switching emergency call connections to reserve~~, a portion of the transmission resources provided by the telephone network **and reserved for switching emergenecy call connecitons**. Thus, for example, a prioritized handling of emergency call connections to be switched to emergency call centers is achieved by the performance parameter of "Selective Circuit Reservation Control" implemented in the switching devices and/or switching centers, a number of links or connecting channels being kept free in specific trunk groups such that the entire trunk group is available only connections with specific traffic criteria - for example emergency call connections.

It is disadvantageous that the permanent reservation of

transmission resources achieved thereby explicitly limits for emergency call connections the transmission resources provided inside the telecommunications network~~, in particular~~. **This is particularly true** for information transfer~~, particularly~~ whenever reserved transmission resources are not currently being used for transferring emergency calls. Optimum use of the transmission resources provided is thereby impossible. Moreover, in the event of whole utilization of the telecommunications network - that is ~~to say~~ all transmission resources provided for connections not of high priority are busy - only the reserved transmission resources are available for high-priority emergency calls that are to be switched, but this in turn signifies a limitation.

In the case of ~~further known,~~ alternatively configured telecommunications networks, it is disadvantageously possible to make use of the transmission resources of a telecommunications network that are reserved for emergency calls only after a previously performed, administrative intervention in the telecommunications network. Such an administrative intervention constitutes, for example, setting the state of emergency or a similar identifier in the respective switching devices.

SUMMARY OF THE INVENTION

In one embodiment ~~It is the object~~ of the invention ~~to improve the~~**, there is** switching of emergency call connections inside telecommunications networks and, in particular, ~~to achieve a guaranteed~~ **a** switching of high-priority connections such as, for example, emergency call connections to appropriate emergency call centers independently of the respective utilization of the transmission resources provided by the communications network.

~~This object is achieved starting from a method and a communications arrangement in accordance with the preamble of patent claims 1 and 12 by means of their~~

~~characterizing features.~~

~~In the case of the method according to the invention~~ **In another embodiment of the invention, there is a method** for controlling instances of access to transmission resources of a communications network for transferring information items~~, a~~**. A** check is made in the event of an instance of access to the communications network as to whether the amount of transmission resources required for the information transfer is currently available in the communications network. ~~The~~ **An** essential aspect of the ~~method according to the~~ invention ~~consists in~~ **is** that the priority of the instance of access is determined upon ascertaining an amount of currently available transmission resources insufficient for the information transfer, and in ~~that~~ the transmission resources required for the information transfer are made available in the communications network in the event of a determined high priority of the instance of access.

~~The~~ **Another** essential advantage of the ~~method according to the~~ invention ~~consists in that~~ **is**, for example, high-priority connection requests - for example emergency calls - arising from an acute emergency situation of a subscriber or a plurality of subscribers are ~~guaranteed to be~~ switched to the appropriate destination - for example an emergency call center - within the range of technical options and independently of the current utilization of the transmission resources of the communications network. Given sufficient available transmission resources, ~~all~~ transmission resources that can be switched are handled similarly inside the communications network. As a further advantage, the emergency call connections are switched with highest priority to the destination, or to the emergency call center, in an independent fashion, that is to say without administrative intervention - for example by setting in the switching devices an identifier representing the state of

emergency. ~~Carrying out the method according~~ **According** to the invention ~~requires~~ no reservation of transmission resources **is required** for emergency call connections, and**, hence,** ~~so the method according to the invention causes~~ no limitation of transmission resources.

The priority of the instance of access is advantageously determined with the aid of destination information items transferred in the course of the current instance of access, and/or of information items transferred in the course of the current instance of access and representing the type of information items to be transferred. During the information transfer the priority of the allocated transmission resources can be determined by the type of information items transferred ~~claim 3~~. It is possible as a result of this advantageous configuration ~~of the method according to the invention~~ to derive priority of an instance of access to the transmission resources from signaling and/or dialing information items transferred when a connection is being set up, for example. Alternatively, the priority of the instance of access can be derived from an identifier representing, for example, the type of traffic of the information items to be transferred.

In accordance with ~~an~~ **another** advantageous ~~refinement~~ **aspect**, the transmission resources are arranged between switching devices arranged in the communications network and/or between a switching device of the communications network and at least one front-end device arranged in the subscriber access area of the switching device ~~claim 8~~. When the transmission resources required for the information transfer are made available, an identifier, representing the rendering available, is formed for the corresponding front-end device between the at least one switching device and the at least one front-end device and stored in the corresponding switching device. In the case of

the identifier stored for the at least one front-end device, a reduced amount of the transmission resources arranged between the at least one switching device and the at least one front-end device can be used or can be allocated for the transmission of information items having a low priority ~~claim 9~~. This advantageous ~~refinement~~ **aspect** reduces the probability that low-priority connections carried over front-end devices must be automatically triggered in the course of the switching of high-priority connections - for example emergency call connections.

~~Further advantageous refinements of the method according to the invention, and a communications arrangement for controlling instances of access to transmission resources of a communications network are to be gathered from the further claims.~~

BRIEF DESCRIPTION OF THE DRAWING

~~The method according to the~~ **The** invention is explained below in more detail with the aid of a ~~block diagram.~~ **diagram, in which:**

~~The block diagram~~ **Figure 1 shows two switching devices arranged in a communications network.**

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows two switching devices LE1,2 that are functionally of similar design and are arranged in a communications network KN configured as a telephone network. The switching devices LE1,2 represented can be implemented, for example, in each case by an "EWSD" digital, electronic dialing system from Siemens AG. Run to a line trunk group LTG arranged in the first switching device LE1 is an incoming trunk group LB1, that comprises a plurality of time-division-multiplex-oriented transmission channels VKE1...z aligned in the direction of first switching device LE1, and via which the first switching device LE1 is connected to the higher-order communications network or telephone

network KN. A plurality of subscribers and/or communications terminals are connected to further line trunk groups LTG, arranged in the first switching device LE1, for example via a digital subscriber line unit DLU or via separate subscriber connection networks ACCESS. Illustrated in the block diagram in lieu of a plurality of communications terminals is a communications terminal KE - for example an ISDN telephone terminal - that is assigned to a subscriber A TLNA and is connected to the first switching device LE1 via the digital subscriber line unit DLU.

The first switching device LE1 is connected to a line trunk group LTG arranged in the second switching device LE2 via a further line trunk group LTG and via an outgoing trunk group LBA connected to said line trunk group. The trunk group LBA outgoing from the first switching device LE1 comprises a plurality of time-division-multiplex-oriented transmission channels VKA1...z aligned in the direction of the second switching device LE2, the outgoing trunk group LBA representing the primary route of connections implemented between the first and the second switching device LE1,2. The first switching device LE1 can be connected to the second switching device LE2 via further outgoing trunk groups - not illustrated - respectively representing an overflow route, as well as via additional switching devices - also denoted as transit switching devices, not illustrated.

An emergency call center NOT - for example a police or firefighting unit - is connected to the second switching device LT2 via k trunks or transmission channels VL1...k, the k trunks VL1...k being connected via a front-end device, for example a digital subscriber line unit DLU, to a line trunk group LTG arranged in the second switching device LE2. Arranged ~~in each case~~ in the two switching devices LE1,2 illustrated in the block diagram is a central switching network SN, connected to the respective line trunk groups LTG, for

switching connections and/or connection requests incoming and outgoing at the respective switching devices LE1,2. The central switching network SN is connected ~~in each case~~ to a centrally arranged, coordinating control unit CP, which is assigned a database DB in each case. In the event of connection requests incoming at the switching devices LE1,2, the respective control unit CP evaluates in functional relationship with the respective assigned database DB signaling and/or dialing information items transferred in the course of the connection setup, and controls the switching or switching through of the transmission channels VKE1…z, VKA1…z, incoming and outgoing at the respective switching device LE1,2, as a function of the respectively determined dialing or destination information items - this evaluation and switching process is also denoted as "digit evaluation and routing".

In each database DB assigned to a switching device LE1,2 and provided for the digit evaluation, the destinations respectively representing an emergency call center NOT are marked by an appropriate identifier, an identifier representing the traffic type of emergency call being assigned to a connection that is incoming at a switching device LE1,2 and is to be switched at an emergency call center NOT. For each connection switched or switched through via a switching device LE1,2, this identifier representing the traffic type transferred via the respective connection is stored in the appropriate switching device LE1,2, for example in a further database - not illustrated - assigned to the central control unit CP. For example, ~~all~~ connections switched or switched through to an emergency call center NOT via a switching device LE1,2 or via a transit switching device have the identifier "traffic type: emergency call". If a requested connection can be successfully switched or switched through to the dialed destination inside a switching device LE1,2, the switching or switching-through

operation is performed independently of the traffic type determined during the connection setup, that is to say independently of whether the destination has an identifier representing an emergency call center, or not.

It may be assumed for the further exemplary embodiment that the subscriber A TLNA requests via the communications terminal KE an emergency call connection (VN) for the purpose of transferring an emergency call to the nearest emergency call center NOT. It may also be assumed that ~~all~~ trunk groups LBA outgoing from the first switching device LE1 in the direction of the second switching device LE2, that is ~~to say all~~ transmission channels VKA1...z directed via the primary route and, possibly, via existing overflows in the direction of second switching device LE2 are busy. For example, a normal telephone connection vtel is run from the telephone network KN to the first switching device LE1 via the xth transmission channel VKEx arranged in the incoming trunk group LBE. The telephone connection vtel is switched through or passed on in the direction of the second switching device LE2 to the xth transmission channel VKAx(vtel) inside the outgoing trunk group LBA of the primary route via the switching network SN arranged in the first switching device LE1. The telephone connection vtel run to the second switching device LE2 is passed on via the switching network SN to a communications terminal and/or subscriber - not illustrated - connected to the second switching device LE2.

During evaluation of the destination information items transmitted by the subscriber A TLNA - for example dial digits identifying the emergency call center - by means of the control unit CP arranged in the first switching device LE, the emergency call center NOT connected to the second switching device LE2 is, for example, determined as the nearest emergency call center. It is not possible on the basis of the described utilization

of the communications network KN to determine in the course of the connection setup any free link or any free transmission channel VBA1...z inside the trunk group LBA outgoing within the framework of the primary route and the overflows. This state is also denoted as "congested". According to the invention, in the case of a connection requested in the "congested" state the traffic type of the connection to be switched is determined by evaluating the destination information items. If a connection to be switched is not assigned the identifier "traffic type: emergency call", or not assigned an alternative identifier representing a high priority - not described in more detail in this exemplary embodiment - the requested connection is rejected. The connections not having the identifier "traffic type: emergency call" are also denoted below as non-emergency call connections. The rejection of non-emergency call connections in the "congested" state is achieved, for example, by applying a "congested tone" representing the "congested" state and by revertive clearing of the initiated connection setup. If, however, during a connection setup a connection having the identifier "traffic type: emergency call" is determined when evaluating the signaled destination information items, an "automatic triggering mechanism" is started in the course of which the connections currently being conducted in the outgoing trunk group LBA of the primary route are analyzed. According to the invention, there is randomly determined inside the outgoing trunk group LBA of the primary route a transmission channel - here the xth VKAx, for example - via which a current non-emergency call connection - here the normal telephone connection vtel - is carried. The randomly determined non-emergency call connection vtel, or the determined xth transmission channel VKAx is subsequently cleared automatically by the first switching device LE1. An appropriate message or a suitable signaling tone can advantageously be transferred to the subscribers of the automatically cleared connection VKAx.

The emergency call connection vnot requested by the subscriber A TLNA is subsequently switched through via the cleared transmission channel VKAx and marked with the (transient) identifier "traffic type: emergency call". Note that the identifier "traffic type: emergency call" is not signaled between the switching devices LE1,2; in each switching device LE1,2, the identifier "traffic type: emergency call" can be derived from emergency call connections to be switched with the aid of the transferred destination and/or dialing information items from the information items stored in the respective database DB.

In the second switching device LE2, the emergency call connection vnot run up via the cleared transmission channel VKAx is passed on to the connected emergency call center NOT. The emergency call connection vnot switched through by means of the "automatic triggering mechanism" is illustrated in the block diagram by a dashed arrow. In this exemplary embodiment, the emergency call center is connected to the second switching device LE2 via k trunks VL1...k. The k trunks VL1...k are each relevant to emergency calls in this variant connection. For the case in which all k trunks VL1...k are busy - for example owing to a plurality of incoming emergency calls and/or telephone connections outgoing from the emergency call center NOT - it is possible in the case of a further emergency call connection vnot initiated, for example, by the subscriber A TLNA that none of the connection currently carried via the k trunks VL1...k are automatically cleared, such that in this case the emergency call connection v not initiated by the subscriber A TLNA and passed on to the second switching device LE2 via the cleared transmission channel VKAx cannot in principle be passed on to the emergency call center NOT.

In accordance with a further variant connection - illustrated by dashed lines in the block diagram - the

emergency call center NOT is connected to the switching network SN of the second switching device LE2 via a front-end device RDLU having concentration properties - for example via a detached subscriber line unit - and via a line trunk group LTG. Further communications devices and/or subscribers not assigned to the emergency call center NOT can also be connected to the front-end device RDLU - this not being illustrated. The connection between the second switching device LE2 and the front-end device RDLU can be implemented, for example, by means of a trunk group comprising a plurality of transmission channels, the switching of the emergency call connections vnot incoming at the second switching device LE2 to the emergency call center NOT being performed in the described way according to the invention. If ~~all~~ transmission channels carried from the second switching device LE2 to the front-end device RDLU are busy, according to the invention a transmission channel of a non-emergency call connection currently carried to the front-end device RDLU is cleared, and subsequently the emergency call connection vnot to be switched is passed on via the cleared transmission channel to the front-end device RDLU and to the emergency call center NOT connected thereto.

In accordance with an advantageous ~~development~~ **embodiment**, an identifier representing a "transient emergency state" can be set for the front-end device RDLU connected to the second switching device LE2, and stored in the second switching device LE2 - for example in the database DB. If in the course of passing on emergency call connections vnot via the front-end device RDLU to the emergency call center NOT, a non-emergency call connection is automatically cleared, an identifier "transient emergency state" is set and stored by the second switching device LE2 for this front-end device RDLU. The result of setting the identifier "transient emergency state" is that, in a fashion controlled by the second switching device LE2,

~~only~~ a specific maximum percentage of the transmission channels carried from the second switching device LE2 in the direction of or to the front-end device RDLU is still used to transfer "non-emergency call connections". By contrast, emergency call connections vnot incoming at the second switching device LE2 can be switched via ~~all~~ transmission channels to the emergency call center NOT via the front-end device RDLU. Setting the identifier "transient emergency state" reduces the probability that non-emergency call connections carried via front-end devices RDLU need to be automatically cleared in the course of switching high-priority emergency call connections. The identifier "transient emergency state" set in the second switching unit LE2 for a connected front-end device RDLU is advantageously reset independently by the switching device LE2, for example when the ~~said~~ maximum percentage of busy transmission channels for transferring non-emergency call connections is undershot for a prescribable time interval. The precribable time interval can comprise, for example, 90 seconds, which corresponds to the mean holding time.